

VISIT...

LANZAROTE
Caliente.COM

Your Turn

Write a short essay telling how something works. You might explain something you already know about. Or, you might decide to do research to find out how something works. As you write your explanation, remember that it has to make sense to anyone who will read it. Rearrange ideas if necessary. Use the writer's checklist to check your writing.



Writer's Checklist

- ☒ **Ideas and Content:** Did I select a topic that I can explain to others?
- ☒ **Organization:** Did I **rearrange ideas** so that they fit together well?
- ☒ **Voice:** Did I make my explanation clear by using examples from everyday life?
- ☒ **Word Choice:** Did I use common words instead of complex, scientific terms?
- ☒ **Sentence Fluency:** Did I use prepositions to help my sentences and paragraphs flow well?
- ☒ **Conventions:** Did I use commas correctly after introductory words? Did I proofread my spelling?





Talk About It

If you could be a scientist, what would you study? What do you think the scientist in this photograph is doing?



Find out more about scientists at

www.macmillanmh.com

Scientists at Work



Vocabulary

specimens	scoured
erupted	biology
murky	research
dormant	observer



Word Parts

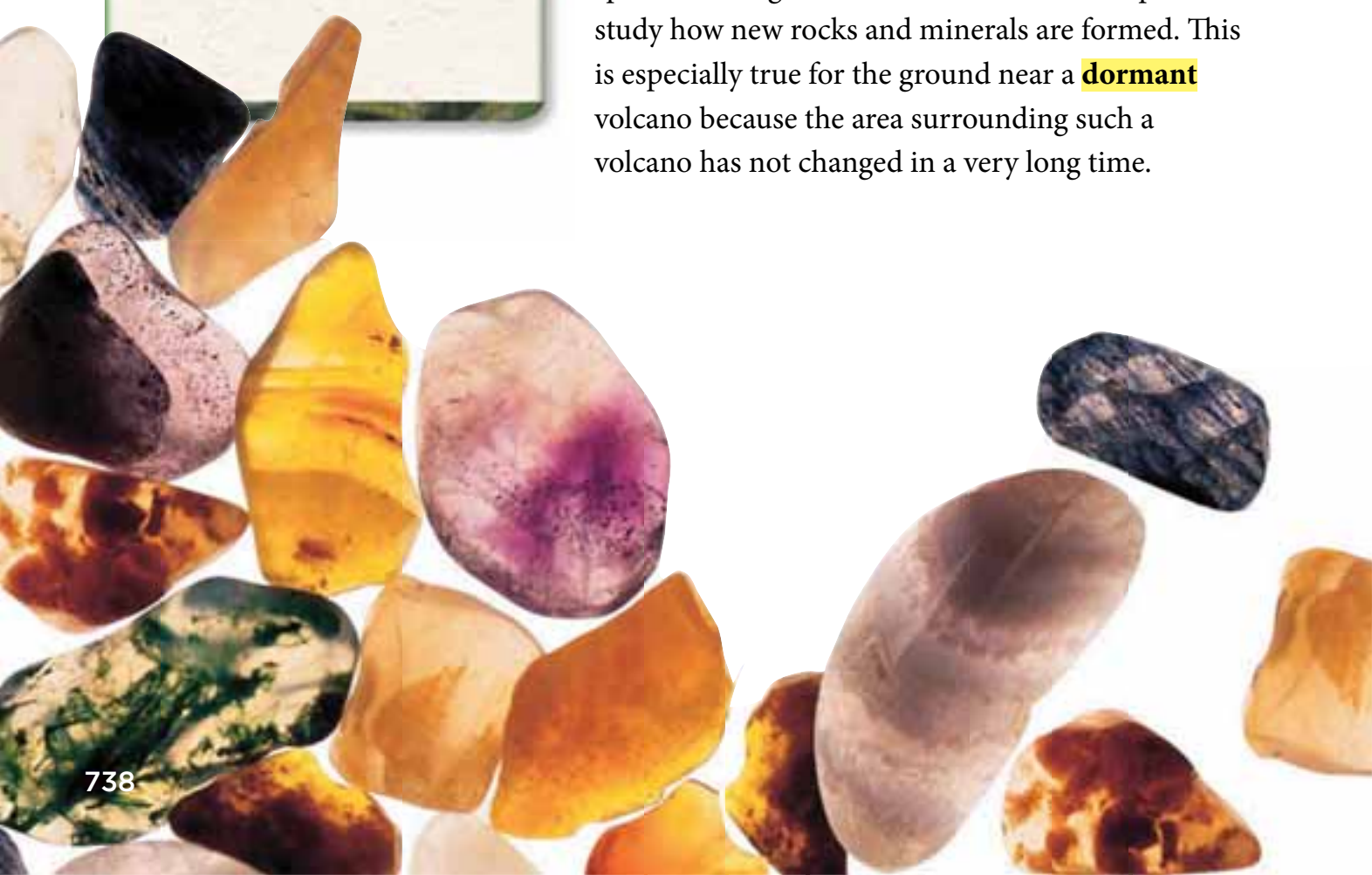
Some words have **Greek** or **Latin Roots**. If you know the meaning of a root, you can figure out a word's definition. For example, *bio-* means "life," so *biology* means "the study of living things."

Dr. Priscilla C. Grew, GEOLOGIST

by Josh Taylor

Dr. Priscilla C. Grew is a well-known scientist in the field of geology, the study of Earth's rocks. As a geologist, Dr. Grew looks at a lot of **specimens** to learn how Earth has changed in the past 4.5 billion years.

A good time and place to look for these changes is after a volcano has **erupted**. Afterward, the air becomes dark and **murky** from ash. When the ash settles, it blankets the land. Sometimes a volcano can release hot lava as well. When hot lava spills out, the ground becomes an excellent place to study how new rocks and minerals are formed. This is especially true for the ground near a **dormant** volcano because the area surrounding such a volcano has not changed in a very long time.



Areas affected by earthquakes are another good place to find a geologist. Early in her career, Dr. Grew helped many people in California lower the chances of getting harmed during major earthquakes. Then Dr. Grew moved to Minnesota where she became the first woman to be named state geologist. She and her team searched all over the state for minerals in the soil. Once they were found, they were **scoured** clean and prepared for studies that Dr. Grew would perform.

After leaving Minnesota, Dr. Grew became the first female director of the University of Nebraska State Museum. Visitors to the museum learn about geology, earth science, and **biology**. They enjoy the displays of rocks and fossils.

During her life and career, Dr. Grew has tried to connect the world of rocks and soil to people's needs. By helping people to be safer during earthquakes and looking for important minerals in the soil, Dr. Grew connects her **research** to the real world. All this makes Dr. Grew more than an **observer**. She is a hands-on scientist who is making a difference.



Dr. Priscilla C. Grew

Reread for Comprehension

Summarize Sequence

A Sequence Chart helps you summarize information by listing events or actions in the order that they take place. Use your Sequence Chart as you reread "Dr. Priscilla C. Grew, Geologist" to figure out the sequence of events in Dr. Grew's career.

Event
↓
↓

Comprehension

Genre

Nonfiction gives information and facts about real people, places, events, and situations.

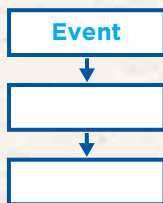


Summarize

Sequence

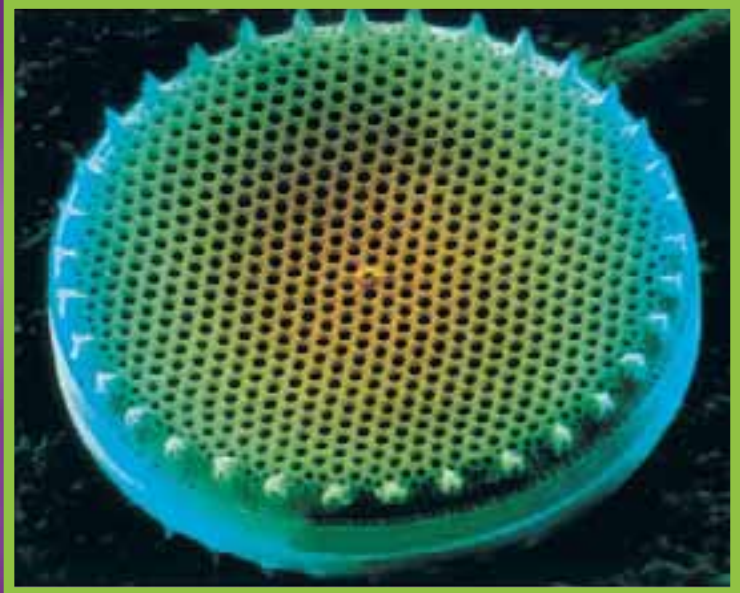
Look for clues that indicate the order of events.

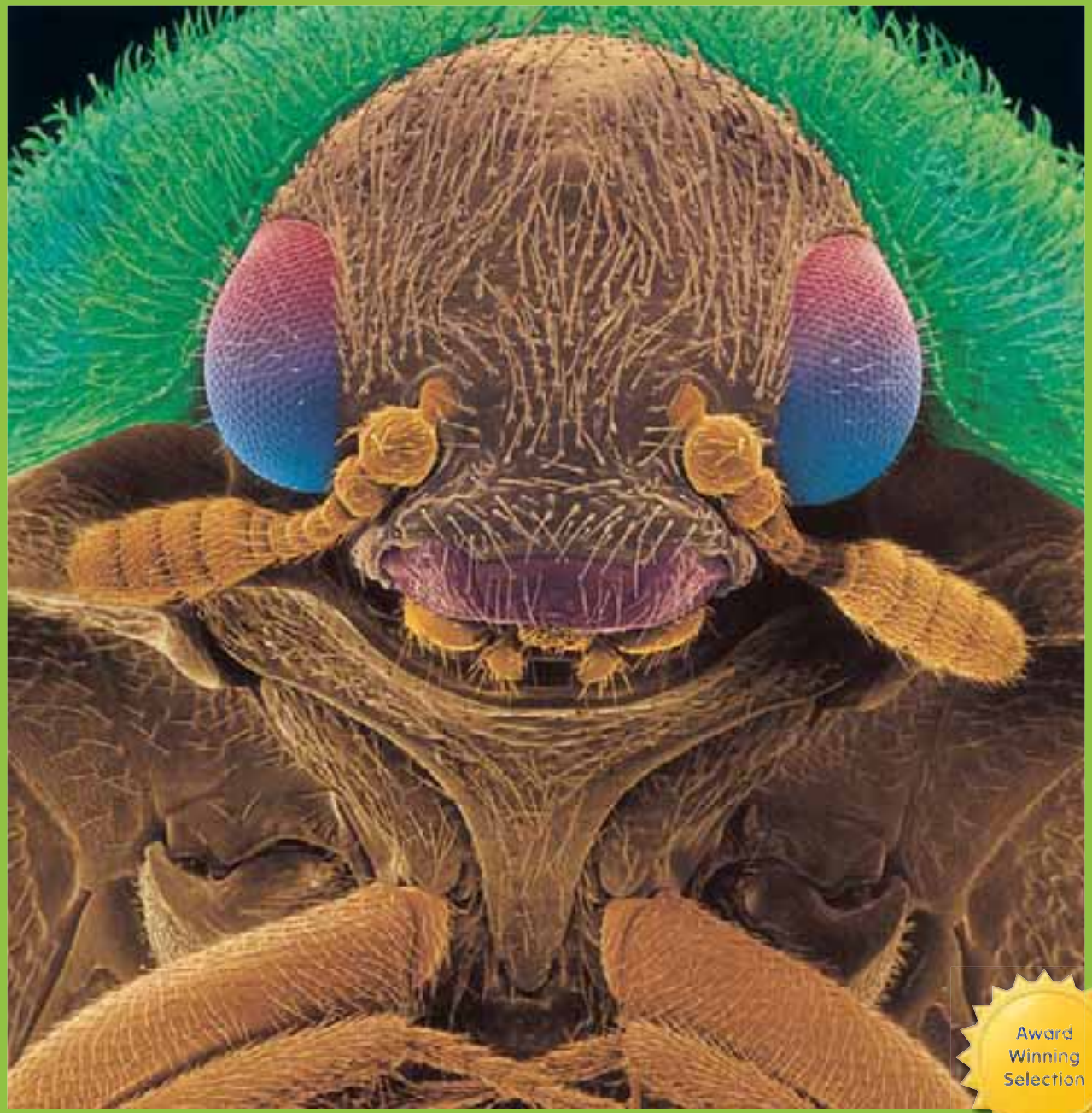
As you read, use your Sequence Chart.



Read to Find Out

What events influenced Dennis's career in science?





Award
Winning
Selection

Hidden Worlds

Looking Through a Scientist's Microscope

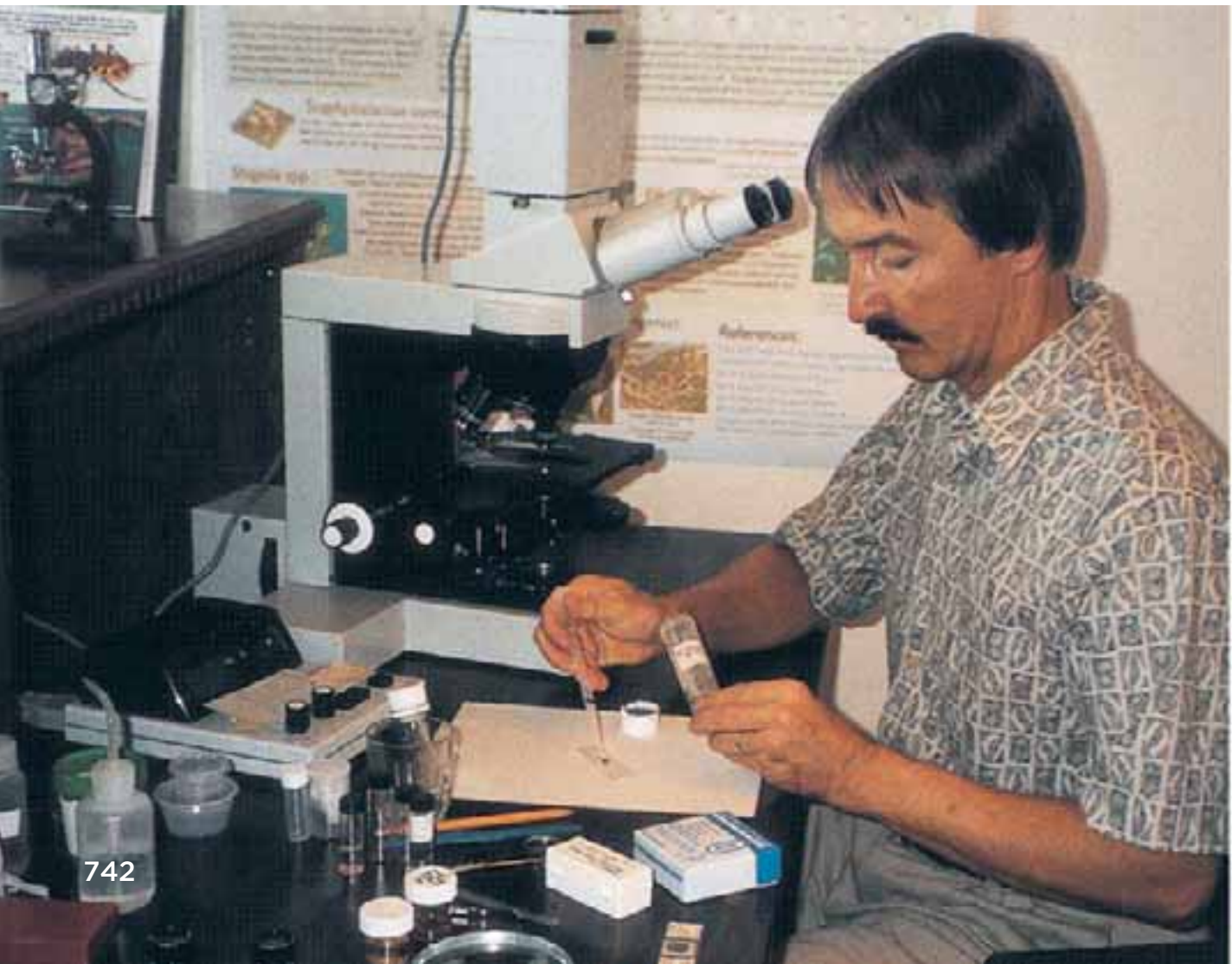
by Stephen Kramer
photographs by Dennis Kunkel

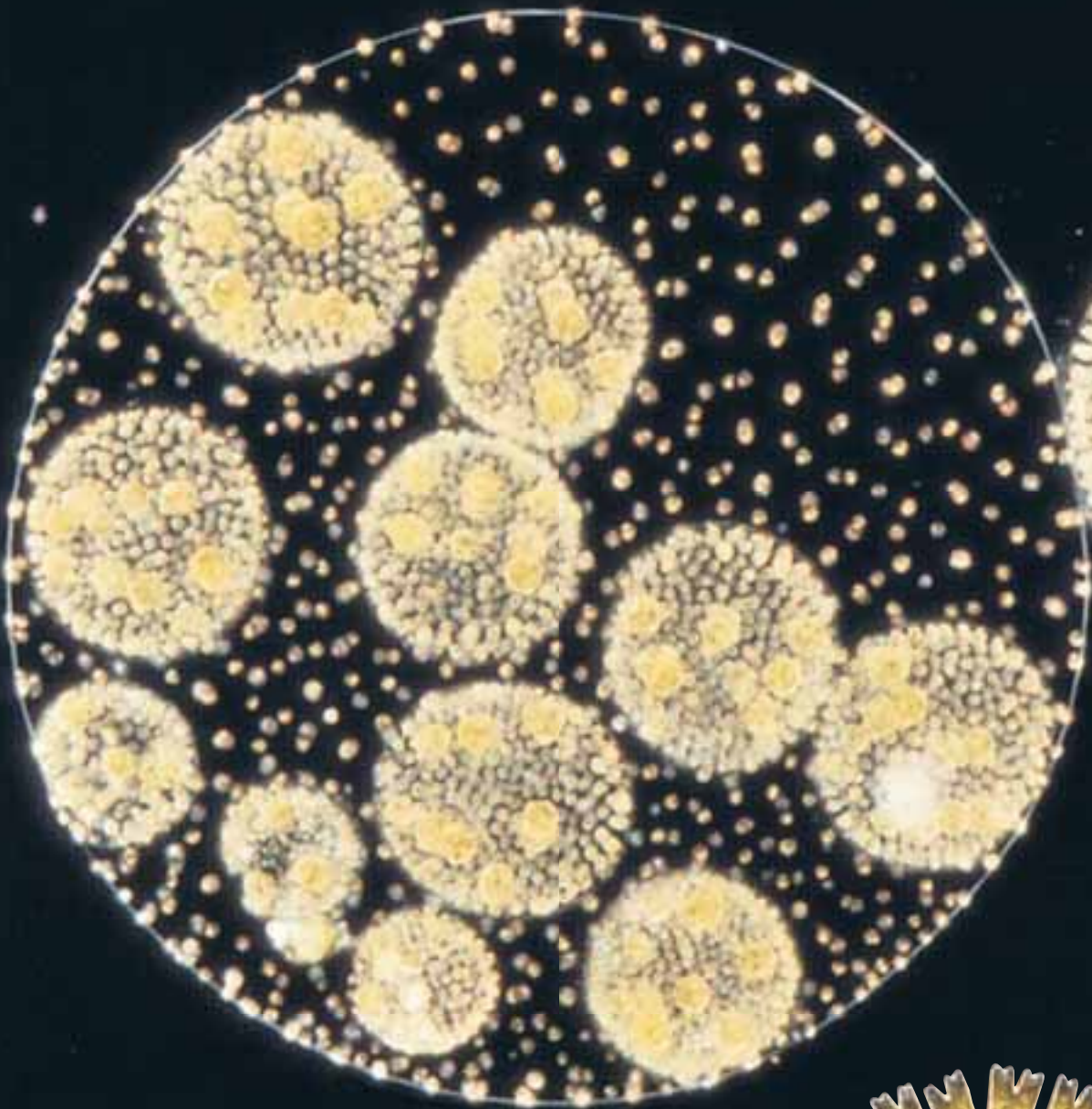
Becoming a Scientist

Dennis Kunkel grew up in the Iowa countryside, where cornfields stretched for miles in all directions. Dennis helped tend the flowers and vegetables in the family garden. He went on weekend fishing trips with his parents and his sisters, and he took care of the family pets. Dennis loved nature and being outdoors, but he did not know that someday he would become a scientist.

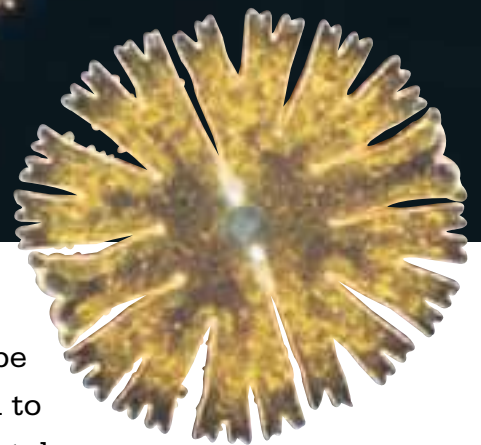
Then Dennis received a gift that changed his life. "When I was ten years old, my parents gave me a microscope for Christmas," he recalls. "It came with a set of prepared slides—things like insect legs, root hairs, and tiny creatures called protozoans. As soon as I unwrapped the microscope, I forgot about my other presents and tried to figure out how to use it."

Dennis working at one of his microscopes





When Dennis looked at pond water with his first microscope, he saw these kinds of simple plants. They are green algae. Above: *Volvox*. Right: *Micrasterias*.



The prepared specimens that came with the microscope were dead. Dennis quickly discovered that it was more fun to observe things that were alive and moving, so he began to take collecting trips. One of Dennis's first trips was to a pond about a mile and a half from his house. "I started hiking down there with my little collecting bottles and bringing back water samples to look at under my microscope," he explains. "I couldn't wait to get home from school in the afternoon so I could go to the pond. Before long I was looking at all kinds of fascinating creatures."

Dennis used his microscope to look at anything he could fit under its lenses. He examined insects, soil samples, and parts of plants. He looked at fur from his pets and seeds from nearby fields. Dennis made drawings of the things he observed, and he spent many hours reading about them.

After Dennis graduated from high school, he enrolled in a junior college in his hometown. A **biology** teacher there encouraged his love of science and microscopes. Dennis often worked in the science lab after school, using microscopes to study the things he collected.

Then Dennis transferred to the University of Washington, in Seattle. Finally he could learn and do things he had dreamed about. "I had the chance to work in labs with good microscopes," explains Dennis. "I spent hours speaking with professors and students about science. I had dreamed of exploring and learning about undersea life like Jacques Cousteau, but until I left Iowa I had never even seen the ocean. While I attended the University of Washington, I learned how to scuba dive. It was thrilling to go underwater to observe and collect the plants and animals I wanted to study."

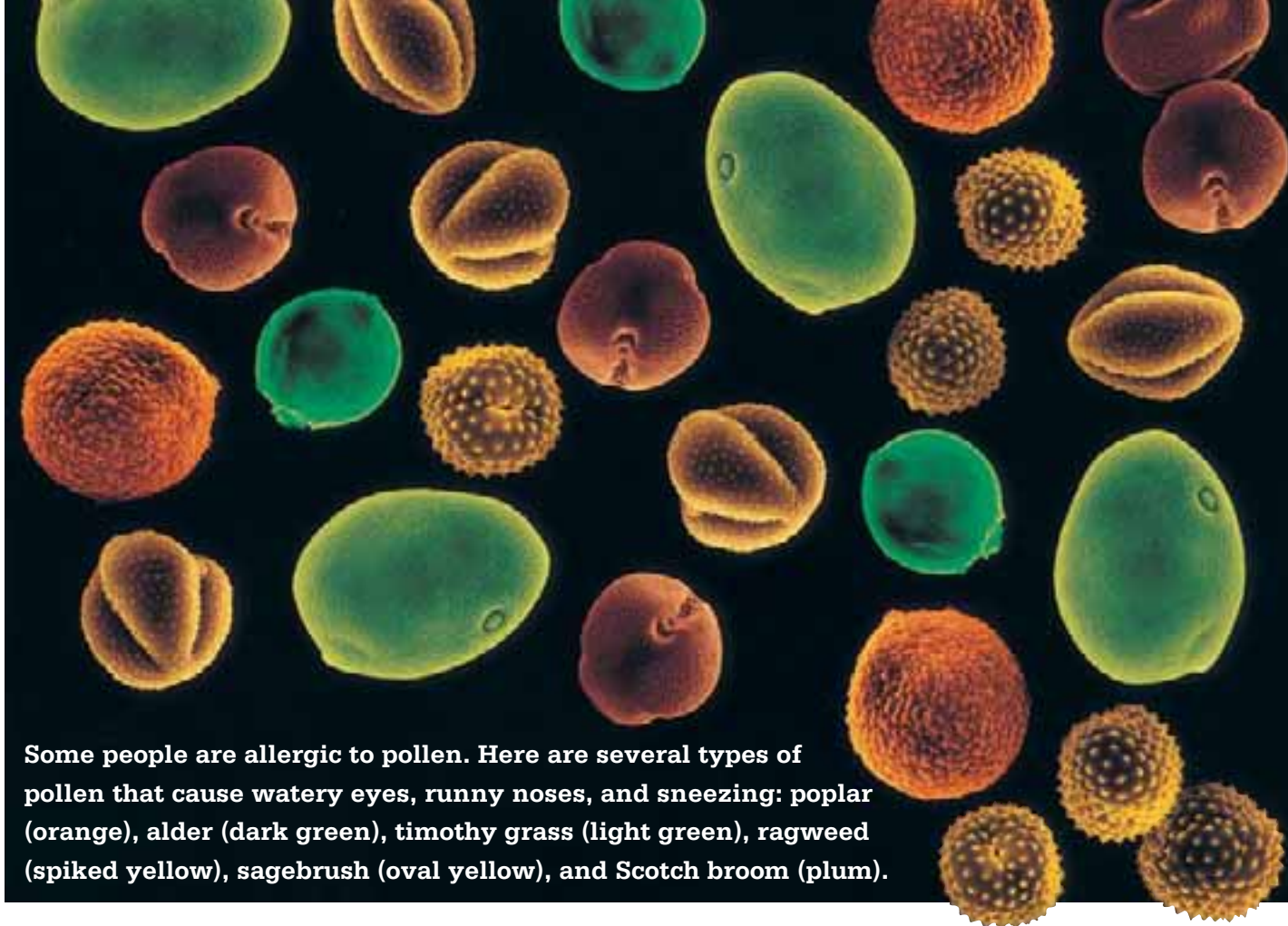
**Dennis examines leaves
with two young scientists.**



Sequence

What clue words does the author use to indicate the time order of events in Dennis Kunkel's life?





Some people are allergic to pollen. Here are several types of pollen that cause watery eyes, runny noses, and sneezing: poplar (orange), alder (dark green), timothy grass (light green), ragweed (spiked yellow), sagebrush (oval yellow), and Scotch broom (plum).

In graduate school, Dennis began to use the science department's electron microscopes for his own **research**, studying tiny living things called cyanobacteria. But Dennis also used the microscopes to help other scientists. He helped one of his professors study and classify pollen grains from different kinds of flowers. He helped a fellow graduate student examine wood with an electron microscope to learn about how plant cells deposit minerals and create "hard" wood. He helped other students with their studies of algae, fungi, and flowering plants.

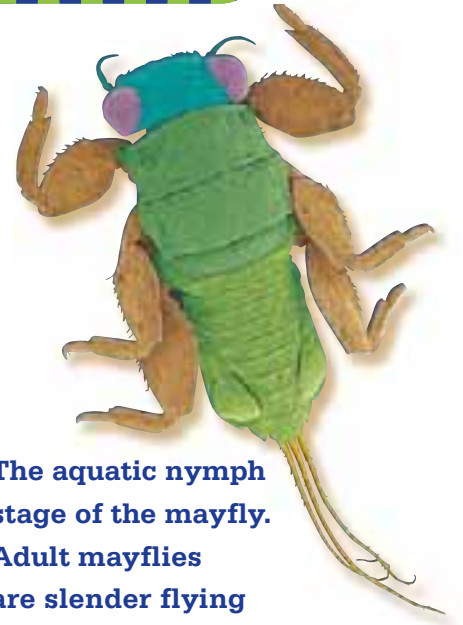
After eight years of graduate work—including thousands of hours of research and work with microscopes—Dennis earned a Ph.D. in botany, the study of plants. Although Dennis was finishing his schooling, he was just beginning a lifetime of scientific learning and discovery.

Dennis worked on research projects at the University of Washington and the University of Hawai'i for about twenty-five years. Now he does much of his work in his home on the island of O'ahu, Hawai'i.

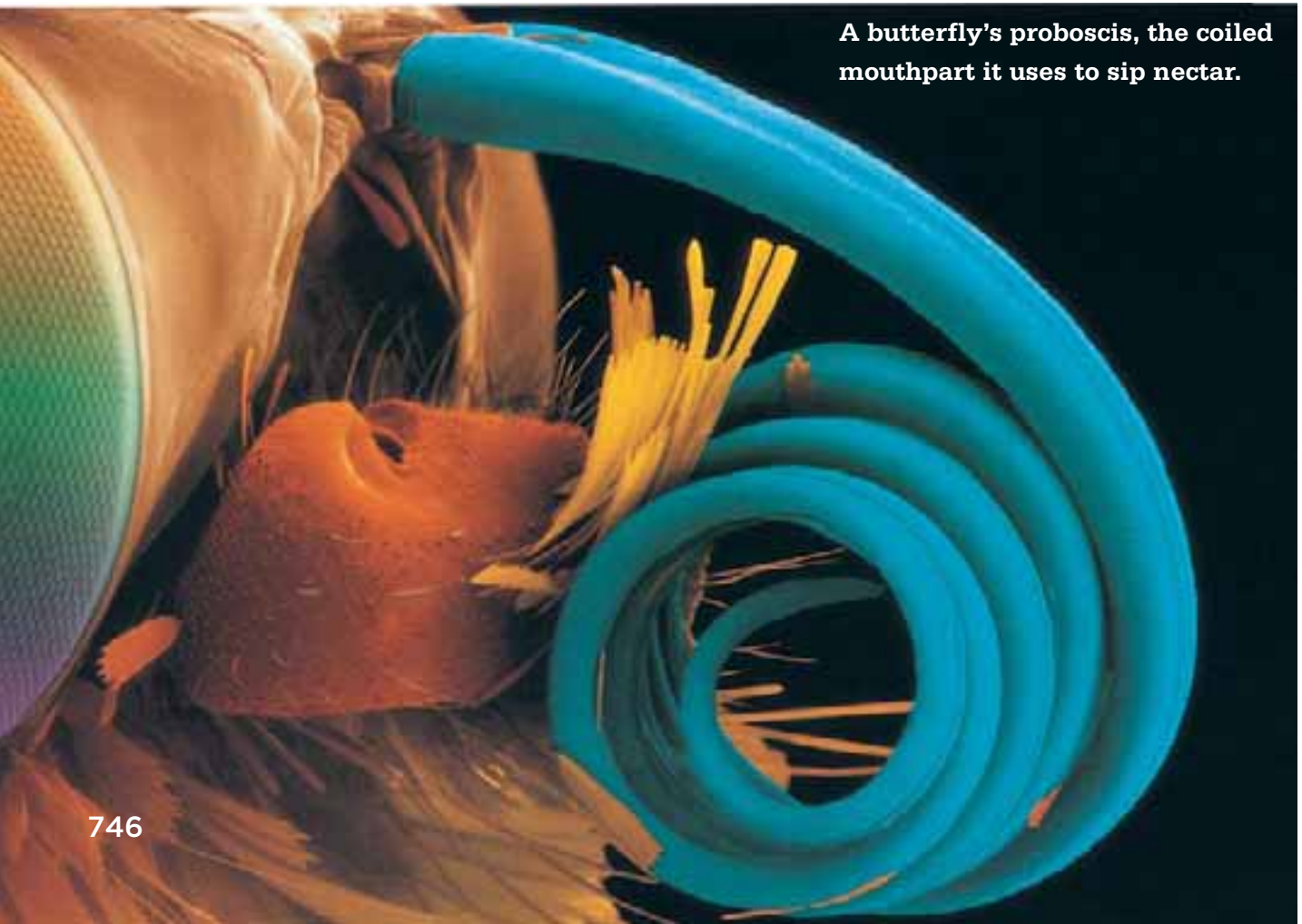
Working as a Scientist

Scientists are explorers. They usually make discoveries by asking questions and then trying to answer them. Some scientists find their answers in laboratories, surrounded by equipment and instruments. Others travel to natural areas to find their answers. Dennis's work has taken him to mountains, rainforests, deserts, caves, beaches, and into the sea.

Whenever Dennis goes on field trips, he takes along collecting boxes and bottles. When he returns to the lab, the boxes and bottles are usually full of interesting **specimens**: algae, lichens, mushrooms, seeds, leaves, insects, bark, soil, and flowers. Dennis has explored hidden worlds in places ranging from the blast zone of a volcano to the dust balls underneath people's beds!



The aquatic nymph stage of the mayfly. Adult mayflies are slender flying insects found around streams and ponds.



A butterfly's proboscis, the coiled mouthpart it uses to sip nectar.



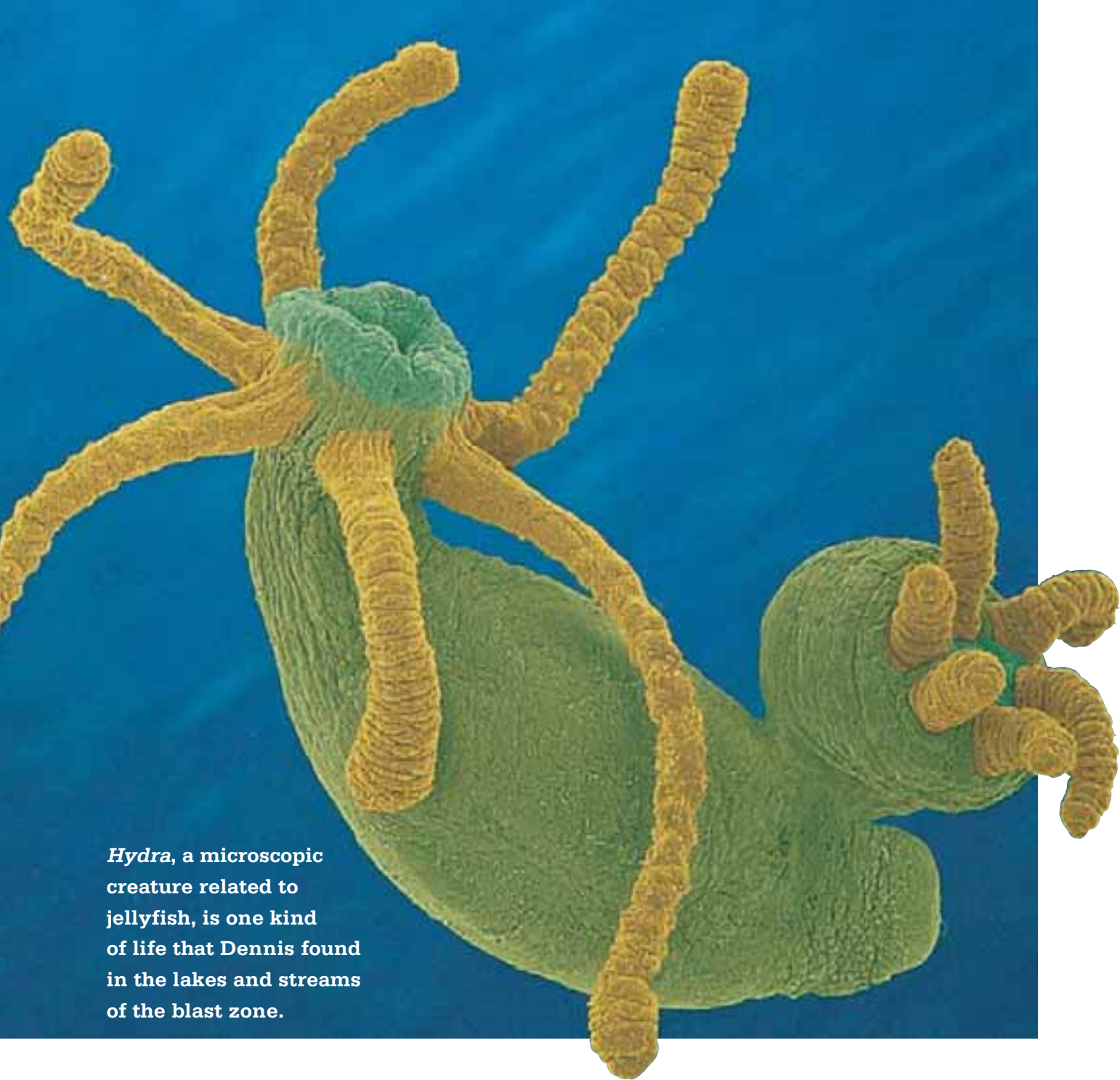
Dennis and the scientific team collect water samples.

Mount St. Helens

In 1980, a **dormant** volcano called Mount St. Helens **erupted** in Washington State. The blast from the eruption flattened huge forests of tall trees. Floods of boiling mud and water from melting snow **scoured** riverbeds. The countryside was covered with a thick layer of ash for miles around.

Some of the first people allowed to visit the blast zone were biologists, scientists who study living things. They were stunned by the destruction. One of the first things they wanted to know was whether any living things had survived.

A team of scientists from the University of Washington made plans to study the lakes and streams of the blast area. Since Dennis was an expert on algae, the simple plants found in lakes and streams, he was invited to help with the study. The scientists traveled to a camp set up on the north side of Mount St. Helens. Twice a day, a helicopter flew them into the blast zone. All they could see, for miles in every direction, were dead trees blanketed by a heavy layer of ash.



Hydra, a microscopic creature related to jellyfish, is one kind of life that Dennis found in the lakes and streams of the blast zone.

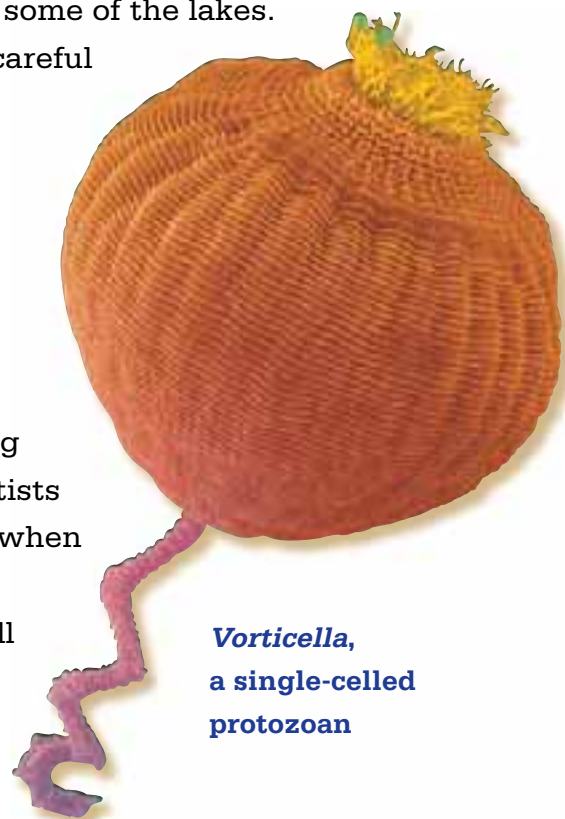
The scientists were thrilled because they had never explored the area around an active volcano so soon after this type of eruption. But no one knew when the mountain might erupt again. In fact, no one even knew for sure whether it was safe to land a helicopter in the blast zone. Some pilots thought the ash stirred up by the whirling helicopter blades might choke the engines. So Dennis and the other scientists weren't allowed to land in the study area on the first few trips. They had to collect their water samples while the helicopter was in the air!

As Dennis and the team crisscrossed the blast zone in the helicopter, they kept their eyes open for water. When they spotted a lake or pond that had survived the blast, the pilot flew the helicopter into position. As the helicopter hovered over the **murky** gray water, Dennis lowered collecting bottles on ropes. The bottles had triggers so Dennis could open them at different depths. This allowed him to collect some water samples from near the surface and others from deep in the lakes.

The first water samples the scientists collected showed that some of the lakes were completely dead. Nothing had survived the heat, gases, and choking ash of the eruption.

Just a few weeks later, Dennis used microscopes to look at new water samples he had collected from the same lakes. He was amazed to see algae, protozoans, and bacteria living in the water. Within several months, small crustaceans—animals that feed on algae and bacteria—began to reappear in some of the lakes.

Dennis and the other scientists kept careful records of the kinds of living things that returned to the lakes and when they reappeared. They identified the kinds of algae, protozoans, bacteria, and crustaceans they found. Later, Dennis and the team also discovered that frogs and fish were returning to some of these lakes, apparently carried in by surrounding streams. Their studies helped other scientists understand what happens to life in lakes when a nearby volcano erupts—and how living things eventually return to areas where all life was destroyed.



***Vorticella*,**
a single-celled
protozoan



Sequence

List the different life forms that developed in the dead lakes near the volcano in the order that they appeared.

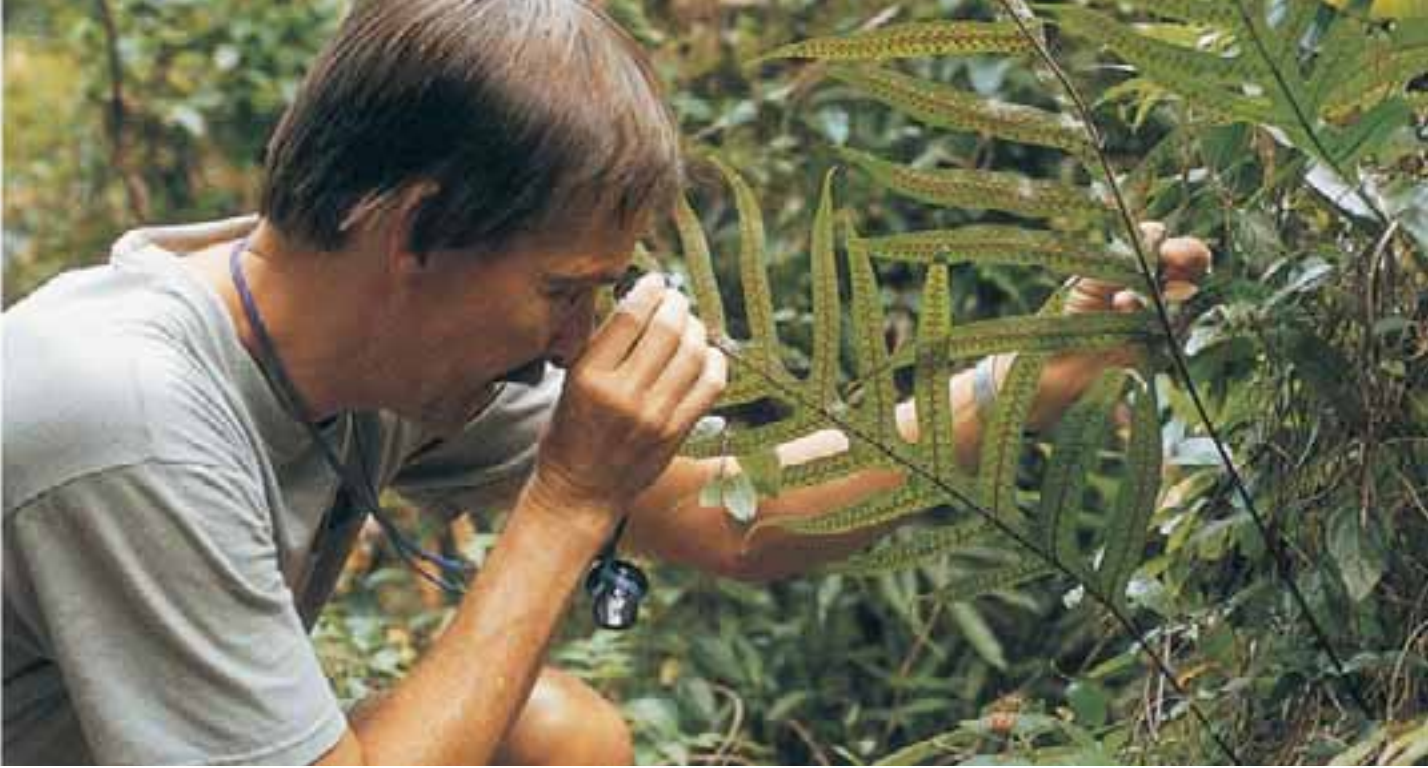
How to Become a Scientist

Here is Dennis's advice for students who think they might like to become scientists:

Become an **observer**. One of the most important things you can do to become a good scientist and microscopist is practice being a careful observer. Find a comfortable chair and put it in the middle of your garden, yard, or a park. Sit in the chair for ten minutes or thirty minutes or an hour. Watch the insects that fly past or land on the plants. Look at the shapes of leaves and stems and branches. Listen to the sounds of buzzing bees and chirping crickets. See if you can find a sight or smell or sound that surprises you. Use a loupe or magnifying glass to look closely at interesting objects.

Dennis and graduate student examine a South African clawed frog.





Dennis looking closely at a fern leaf

Learn everything you can about a topic that interests you.

Suppose you'd like to explore flowers by using a microscope. Go to the library and check out some flower books. See what you can find on the Internet. Pick some flowers and carefully take them apart. Use a loupe or a magnifying glass to see how everything fits together. The more you know about flowers from reading about them and observing them, the more you'll understand when you begin looking at them with a loupe or a microscope.

Ask for help from a knowledgeable person. After you've learned everything you can on your own, ask someone else to help with questions you still have. Maybe there's someone at a nearby school or museum who knows about insects, spiders, algae, moss, or something else you'd like to learn about. If you don't have a microscope of your own, maybe a teacher would help you look at some specimens with a school microscope.

Find a scientist to talk to or find a place where scientific research is being done. If you still want to learn more, you may be able to find a scientist to talk to at a nearby college, university, or research station. Write a letter or an e-mail message to the scientist, explaining what you're interested in. Ask if you can schedule a time to visit. Most scientists are happy to talk to students who share their passion for science.

Under the Microscope with Stephen Kramer and Dennis Kunkel

Stephen Kramer is an author and teacher. When he is not writing about avalanches or following Dennis Kunkel into a volcano, he is teaching fifth graders. Both of his careers focus on a love of science and teaching. He especially enjoys teaching children different scientific facts about bats, rainforests, or machines. Stephen lives in Vancouver, Washington, with his wife and their two sons.

Another book by Stephen Kramer:
Tornado



Dennis Kunkel is often found looking at fleas, bacteria, and blood cells under his microscope. He has made large contributions to the science world with what he has witnessed through his lens. Dennis loves the new information his microscope unveils because he appreciates the beauty of what is missed by the naked eye. Dennis's research and pictures have appeared in magazines, museum exhibits, and even movies.



Find out more about Stephen Kramer and Dennis Kunkel at
www.macmillanmh.com

Author's Purpose

How can readers tell that Stephen Kramer respects scientists greatly? Give examples from the text, headings, or photos.

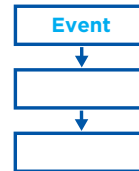


Comprehension Check



Summarize

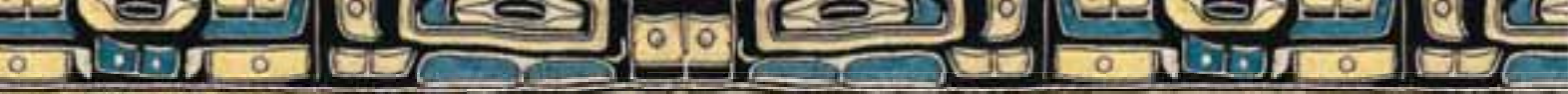
Use your Sequence Chart to summarize important information from *Hidden Worlds: Looking Through a Scientist's Microscope*.



Think and Compare

1. Describe the steps Dennis thinks are important in becoming a better scientist. **Summarize: Sequence**
2. Reread page 749. Why do you think Dennis looked for living things after the eruption of Mt. St. Helens? Include facts from the selection in your answer. **Analyze**
3. Explain how you would practice becoming a careful **observer**. Include where you would choose to observe and what you might see, smell, hear, and touch. **Evaluate**
4. What effect do scientists like Dennis Kunkel, Albert Einstein, and others, have on the world? Explain your answer. **Analyze**
5. Reread “Dr. Priscilla C. Grew, Geologist” on pages 738–739. Compare and contrast Dr. Grew’s experiences with Dennis Kunkel’s career. Use details from both selections in your answer. **Reading/Writing Across Texts**





Language Arts

A **Myth** is a story that tells about the belief of a group of people. Myths often tell about gods and heroes. Sometimes they explain something that happens in nature.



Literary Elements

Symbolism is the use of concrete objects to represent abstract ideas or qualities.

Figurative Language, such as simile and metaphor, uses imaginative language to describe objects, places, or people.

Mountain of **FIRE!**

A Native American Myth

retold by Grace Armstrong

Long ago when the world was new, there was one land and one people. All lived together by the great river in peace, worked well, and were happy.

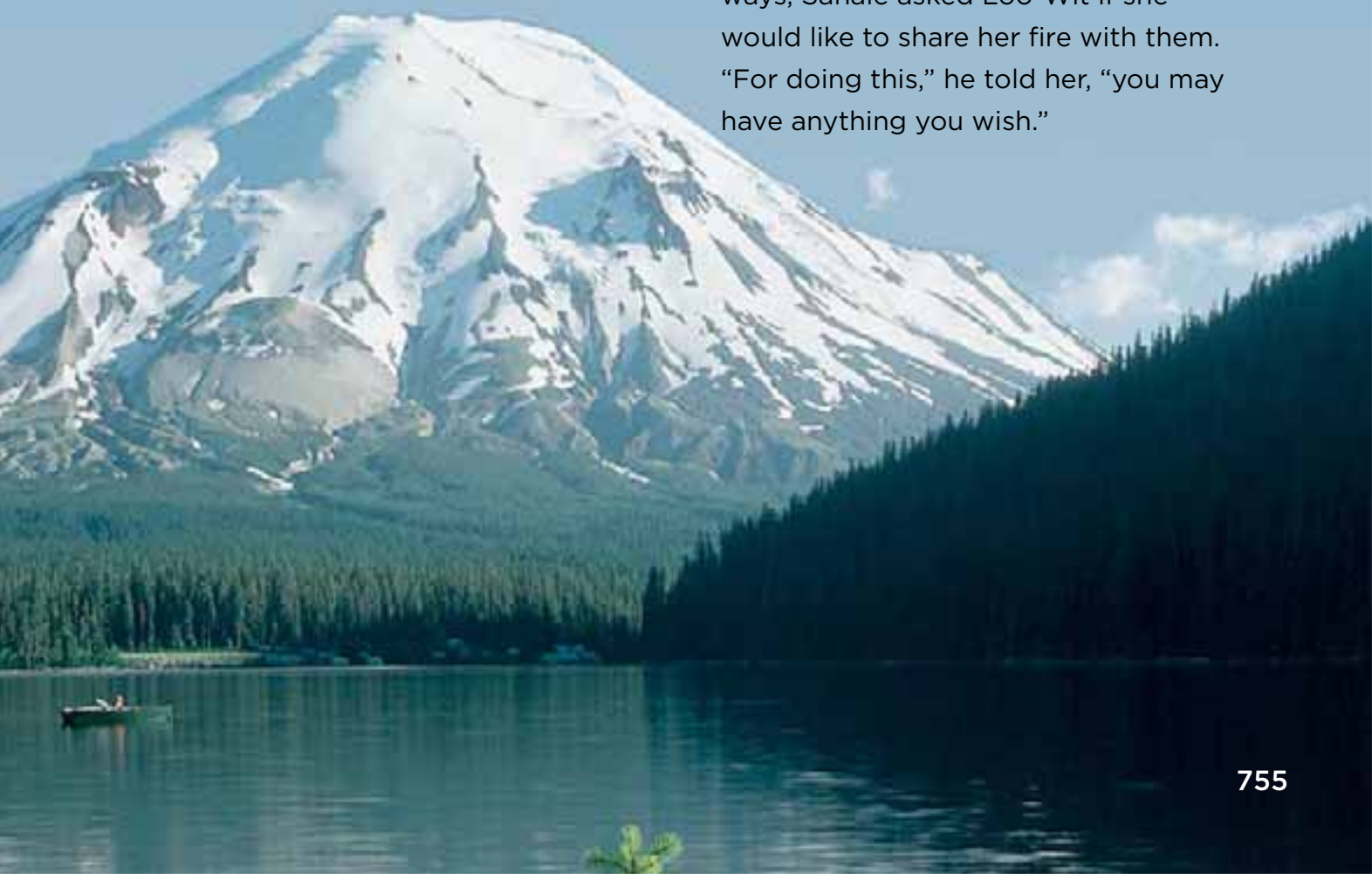
Into this world were born two brothers who grew up quarreling. They argued over who was stronger and who had better land to work. Soon all the people had taken sides. The Great Spirit, Sahale, saw this quarreling and decided to end it.

This simile, comparing the voice to thunder, is an example of figurative language.

↓ In a voice like low, rumbling thunder, Sahale called the brothers together and gave each one an arrow for his bow. He said, "Wherever your arrow falls, that will be your land, and there you will be a chief." The first brother shot his arrow high in the air, and it landed to the south of the great river. He went there with his people, and they became known as the Multnomahs. The second brother shot his arrow into the air and it landed north of the river. There he went with his people, who became known as the Klickitats.

The brothers lived with their people in peace for some time. As time passed though, envy began to cause quarrels. "The Klickitats have better land," some said. "The Multnomahs have more beautiful land," others cried. Sahale heard this bickering that seemed to grow like a storm and was unhappy with the two tribes. When violence threatened, Sahale stopped it by taking away all fire, even the sun, just as the autumn winds, cold, and snow were beginning.

Only one in all the land still had fire. She was Loo-Wit, an old, wrinkled woman with gray hair and quiet ways. She had stayed apart from all the quarrels. After the people had suffered and seemed to have mended their ways, Sahale asked Loo-Wit if she would like to share her fire with them. "For doing this," he told her, "you may have anything you wish."





“I wish to be young and beautiful,” she said.

“Then that is what you will be,” Sahale said.

Sahale led Loo-Wit to a great stone bridge over the river that joined the two lands. The people arrived at the bridge, led by their chiefs, to find the most beautiful woman they had ever seen. She began to give them fire. Loo-Wit kept the fire burning all day until fire was restored to all the people.

This was not to be the end of the quarreling. During this day the two chiefs had both fallen in love

with Loo-Wit and wanted her for a wife. Loo-Wit could not choose between them, and once again, fighting erupted.

The two brothers refused to compromise or work on a solution. Because the brothers were unyielding in their positions, Sahale angrily changed the brothers into mountains. The chief of the Klickitats was turned into the mountain known today as Mount Adams. The chief of the Multnomahs was turned into the mountain known today as Mount Hood.

The use of the mountains, which are rock hard and immovable, represents the brothers' stubbornness and is an example of *symbolism*.



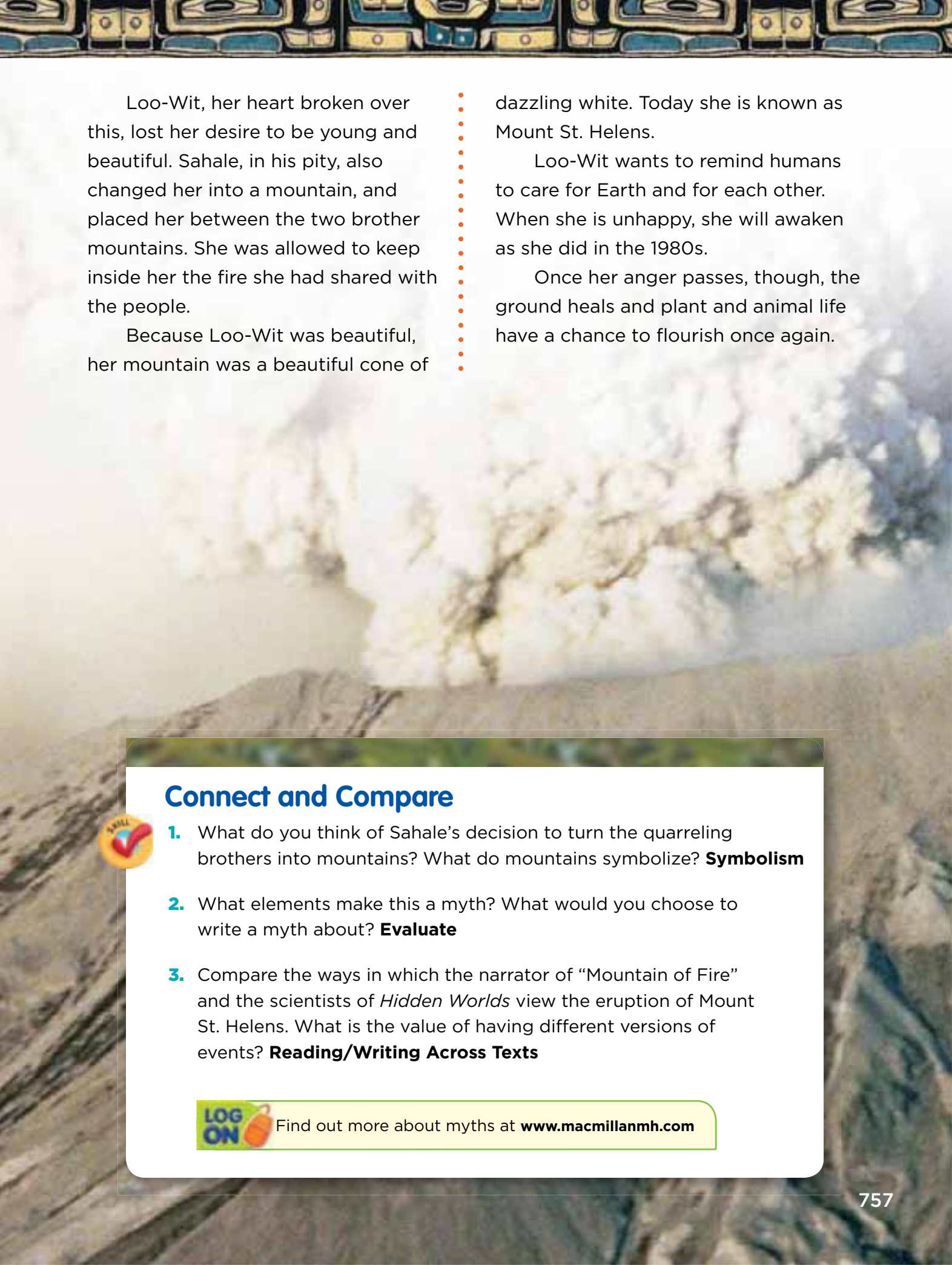
Loo-Wit, her heart broken over this, lost her desire to be young and beautiful. Sahale, in his pity, also changed her into a mountain, and placed her between the two brother mountains. She was allowed to keep inside her the fire she had shared with the people.

Because Loo-Wit was beautiful, her mountain was a beautiful cone of

dazzling white. Today she is known as Mount St. Helens.

Loo-Wit wants to remind humans to care for Earth and for each other. When she is unhappy, she will awaken as she did in the 1980s.

Once her anger passes, though, the ground heals and plant and animal life have a chance to flourish once again.

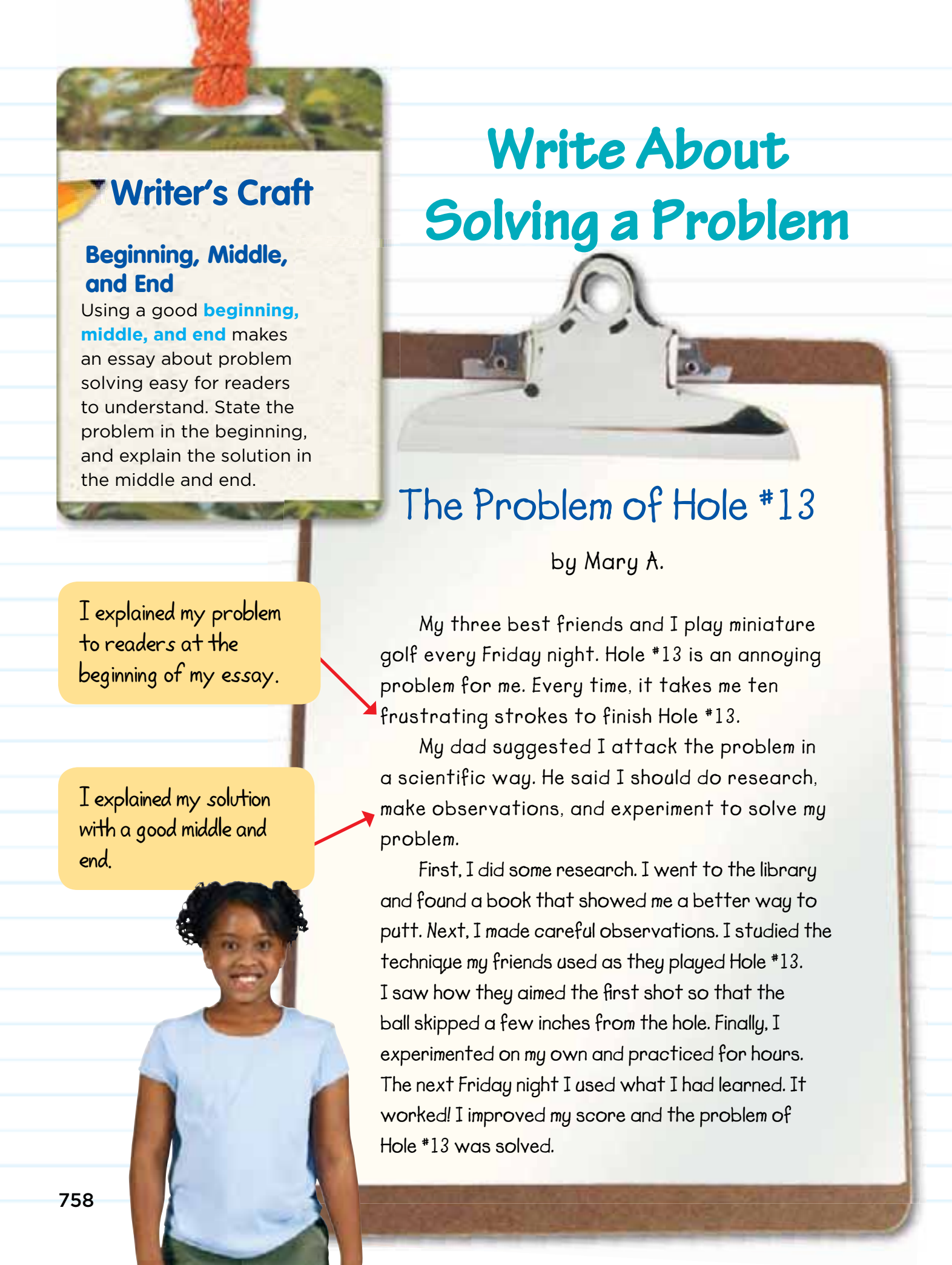


Connect and Compare

1. What do you think of Sahale's decision to turn the quarreling brothers into mountains? What do mountains symbolize? **Symbolism**
2. What elements make this a myth? What would you choose to write a myth about? **Evaluate**
3. Compare the ways in which the narrator of "Mountain of Fire" and the scientists of *Hidden Worlds* view the eruption of Mount St. Helens. What is the value of having different versions of events? **Reading/Writing Across Texts**



Find out more about myths at www.macmillanmh.com



Writer's Craft

Beginning, Middle, and End

Using a good **beginning, middle, and end** makes an essay about problem solving easy for readers to understand. State the problem in the beginning, and explain the solution in the middle and end.

Write About Solving a Problem

The Problem of Hole #13

by Mary A.

I explained my problem to readers at the beginning of my essay.

My three best friends and I play miniature golf every Friday night. Hole #13 is an annoying problem for me. Every time, it takes me ten frustrating strokes to finish Hole #13.

I explained my solution with a good middle and end.

My dad suggested I attack the problem in a scientific way. He said I should do research, make observations, and experiment to solve my problem.

First, I did some research. I went to the library and found a book that showed me a better way to putt. Next, I made careful observations. I studied the technique my friends used as they played Hole #13. I saw how they aimed the first shot so that the ball skipped a few inches from the hole. Finally, I experimented on my own and practiced for hours. The next Friday night I used what I had learned. It worked! I improved my score and the problem of Hole #13 was solved.

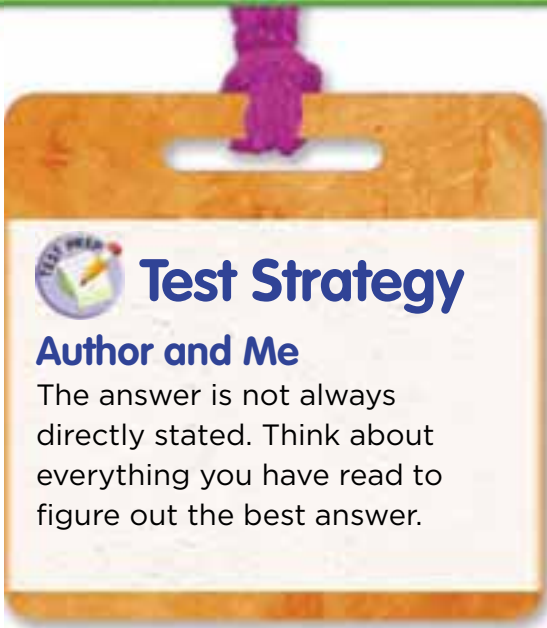
Your Turn

What problem have you recently solved for yourself? Write an essay that explains the problem and the steps you took to solve it. Remember to describe the steps using a good beginning, middle, and end. Use the writer's checklist to check your writing.



Writer's Checklist

- ☒ **Ideas and Content:** Did I describe a problem that I solved on my own?
- ☒ **Organization:** Did I present the steps I took to solve the problem using a good **beginning, middle, and end**?
- ☒ **Voice:** Can the reader tell that I worked hard to solve the problem and that I feel proud of my efforts?
- ☒ **Word Choice:** Did I use clear, precise words to help the reader understand my solution?
- ☒ **Sentence Fluency:** Did I combine some ideas to create longer, more interesting sentences?
- ☒ **Conventions:** Is my essay punctuated correctly?
Did I check my spelling?



National Parks: Our National Treasures

by Carlos M. Spinoza

Where can you go to experience the great outdoors as it was 200 years ago? Fresh air, sparkling lakes, untouched land, and breathtaking scenery are all there for you to enjoy in this country's national parks. There are almost 400 national parks in the United States. One of them may be near your home town. Each park is special, and each park has a story. Where did the idea to protect special parkland originate? It all started with Yellowstone National Park.

Yellowstone National Park

Trappers who had been out West told stories about bubbling mud and steamy springs that gushed hot water and steam. In the East these stories sparked people's

interests. Adventurers set out to find the places that inspired such stories. In 1871 one such adventurer, Ferdinand Hayden, led a group to explore the area that would become Yellowstone National Park. Thomas Moran and William H. Jackson also joined this group. Moran was an artist and Jackson was a photographer. When they arrived they found land that had been formed by a volcano. The volcano had erupted more than 640,000 years earlier. The ash covered the western United States and some of the Midwest and Mexico. Old Faithful and other hot springs amazed the visitors. The stories they had heard seemed to be true!



Moran and Jackson captured the beauty of Yellowstone in paint and on film. Moran became so well known for his watercolor sketches of Yellowstone that people started calling him Thomas “Yellowstone” Moran. Along with Jackson’s black-and-white photographs, Moran’s watercolor paintings were later used to persuade Congress that Yellowstone needed protection.



Thomas Moran,
*Grand Canyon of the
Yellowstone Park, 1872*

The National Park Service

President Ulysses S. Grant thought that protecting natural areas was such a good idea that in 1872 he made Yellowstone the first national park.

He said that Yellowstone would be “set apart as a public park . . . for the benefit and enjoyment of people.”

Yellowstone paved the way for the National Park Service (NPS). The NPS began in 1916. Writer Wallace Stegner said, “National parks are the best idea we ever had. Absolutely American . . . they reflect us at our best . . .” Congress asked the NPS to conserve national treasures “for the enjoyment of future generations.” The NPS now takes care of more than 84 million acres of land in the United States.

Stephen T. Mather was the NPS director from 1917 to 1929. He said:

The parks do not belong to one state or to one section . . . The Yosemite, the Yellowstone, the Grand Canyon are national properties in which every citizen has a vested interest; they belong as much to the man of Massachusetts, of Michigan, of Florida, as they do to the people of California, of Wyoming, and of Arizona.

Answer Questions

The Antiquities Act

In 1906 the Antiquities Act gave the President the power to grant further protection to national parks and other special places. These areas may be valuable because of their beauty or because they are important to history or science. They might contain structures or lands that should be left untouched. The number of places protected by the Antiquities Act has increased over the years. Now these areas can be found on public or private land. Congress also provides for such things as national lakeshores and rivers.

The National Parks and You

Visiting a national park is like traveling back in time. You can view land that looks much as it did when the United States established itself as a nation. You can see natural waterfalls in Yosemite National Park. You can gaze at the sculpted rock of Grand Canyon National Park. You can learn how animals and plants live together in their natural environment at Joshua Tree National Park. If history is your passion, you can explore important events in America's past by visiting Gettysburg National Military Park. Similarly, by visiting the Clara Barton or Frederick Douglass National Historic Sites, you can learn about people who helped make this country great.

These places, events, and people helped write the American story. By learning about them, you can begin to understand and appreciate your own special place in this country's continuing story.

Arches National Park, Utah

Tip

You have to think about the entire selection to choose the best answer.

Directions: Answer the questions.**1. Why are parks called national treasures?**

- A** They were found by accident.
- B** They are operated by the President.
- C** They contribute to the nation's economy.
- D** They preserve untouched natural areas for all people to enjoy.

2. What is the BEST reason for learning about national parks?

- A** to help plan a career
- B** to see where artists painted famous pictures
- C** they will all be gone one day
- D** to find out about the nation's history and natural wonders

3. Why might the National Park Service want photographers and artists to visit their parks?

- A** to create postcards
- B** to develop on-site art schools
- C** to show why we need to continue to protect the parks
- D** to compare their work with that of writers

4. How is visiting a national park like traveling back in time?**5. Do you agree with Wallace Stegner that the national parks are a great idea? Should national parks be protected? Use details from the selection to support your response.****Writing Prompt**

Your friend is coming to visit. Write directions for your friend on how to get from school to your home. Include details such as landmarks and street signs.

